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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,526	03/31/2004	Marie-Pierre Bacos	52186/DBP/N75	3474

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EXAMINER	
LAFOND, RONALD D	

ART UNIT	PAPER NUMBER
1709	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/815,526	BACOS ET AL.	
	Examiner	Art Unit	
	Ronald D. Lafond	1709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *03/31/2004, 07/12/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *IDS 10/22/2004*.

DETAILED ACTION

Claim Objections

1. Claims 16 and 18 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. All of these claims depend from Claim 1, which states that "... in which the said substrate and a non-gaseous precursor ... are placed in contact ...". Claim 16 claims the "Process according to claim 1, in which the substrate and the precursor are at a distance from each other," which fails to further limit Claim 1 and, in fact, broadens the scope of Claim 1. Claim 18 claims the "Process according to claim 1, in which the substrate and the precursor are in contact," which fails to further limit Claim 1 and is redundant.

2. A series of singular dependent claims is permissible in which a dependent claim refers to a preceding claim which, in turn, refers to another preceding claim.

A claim which depends from a dependent claim should not be separated by any claim which does not also depend from said dependent claim. It should be kept in mind that a dependent claim may refer to any preceding independent claim. In general, applicant's sequence will not be changed. See MPEP § 608.01(n).

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 9 and 16 – 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 9 recites the limitations "the said element of the metal is nickel" and "the said intermetallic compound is β–NiAl" in Claim 7. There is insufficient antecedent basis for this limitation in

the claim. Claim 16 claims a "Process according to claim 1, in which the substrate and the precursor are at a distance from each other," which directly contradicts the limitation of Claim 1 which states "the said substrate and a non-gaseous precursor ... are placed in contact," thus rendering Claim 16 indefinite. Claim 17 is also indefinite because it depends from Claim 16.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1 – 15 and 18 – 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darolia (United States Patent 6,273,678), and further in view of Wachtell, et al (United States Patent 3,257,230, hereafter Wachtell).

8. Darolia teaches, as in Claim 1 of this application, a process for forming a protective coating containing aluminum on the surface of a metal substrate (see Column 7, lines 1 – 5, "In operation, aluminum ... [is] first deposited onto the internal airfoil surface by any operable technique, such as vapor phase aluminiding") at a high temperature (see Column 7, lines 45 – 49, "The retort is usually heated to a deposition reaction temperature of from about 1800 F to about 2100 F,") with an atmosphere containing

an active gas which reacts with a non-gaseous precursor (see Column 7, lines 6 – 8, "... an aluminum-containing material (preferably aluminum metal, aluminum alloy, or aluminum-containing compound)," and lines 15 – 17, "The preferred source of aluminum is ... chromium-aluminum chips") to form a gaseous aluminum compound which decomposes on contact with the substrate depositing aluminum metal thereon, characterized in that the said atmosphere contains a gaseous compound of a modifier metal which decomposes on contact with the substrate and deposits the said modifier metal thereon simultaneously with the deposition of aluminum (see Column 7, lines 6 – 12, "A mixture of an aluminum-containing material, a source of the modifying element, and a halide activator ... are placed into the source chamber," Column 7, lines 33 – 36, "The activators and the halide gas containing the modifying elements contact the aluminum-containing material and the source of the modifying element to form the corresponding halide gas," and Column 7, lines 40 – 45, "The resulting ... gas flows through the flow channels ... Aluminum and the modifying elements are deposited onto the ... airfoil surface.").

9. Darolia does not teach that the substrate and a non-gaseous precursor containing aluminum are placed in contact. However, Darolia does state, in Column 7, lines 55 – 60, that "Other operable approaches for introducing the source of aluminum into the internal passages may also be used. Examples include ... pack cementation, and above-the-pack aluminiding." Pack cementation is a term well-known in the art of aluminide coatings that refers to a process in which the substrate and a non-gaseous precursor containing aluminum are placed in contact and then heated. Wachtell teaches just such a limitation (see Column 1, lines 12 – 19, "This invention relates to the diffusion coating of metal articles for the production thereon of an outer coating or layer of enhanced oxidation ... resistance ... in which the article to be coated is heated as embedded in or otherwise in surface contact with a powdered pack or mixture including a metallic coating material...") Therefore, it would have been obvious to one having ordinary skill in the art at the time this application was filed to have used the pack cementation/contact method disclosed in Wachtell in the overall method disclosed by Darolia with a reasonable expectation of success, as Darolia and Wachtell teach that such methods are known to be so capable.

10. Regarding Claim 2, Darolia teaches the process according to Claim 1, in which the said modifier metal is zirconium (see Column 3, lines 64 – 65, "The modifying element is ... zirconium.") Regarding Claims 3 and 4, Darolia teaches the process according to Claim 1, in which the said active gas at least in part comprises the said gaseous compound (see Column 7, lines 33 – 36).

11. Regarding Claim 5, Darolia does not explicitly teach the process according to Claim 3, in which the said active gas solely comprises the said gaseous compound. While Darolia does not explicitly teach this, it teaches, in Column 7, lines 33 – 36, that "... the halide gas containing the modifying elements contact[s] the aluminum-containing material and the source of the modifying element to form the corresponding halide gas." Moreover, Darolia teaches that the "preferred source of zirconium is ... zirconium chloride," which is a halide that contains the modifying element and is a gas at the temperatures at which the claimed process operates, as disclosed by Applicants. Because Darolia discloses that other metal halides are capable of being halide activators (Column 7, lines 9 – 10), it would have been obvious to one having ordinary skill in the art at the time this application was filed to have used an active gas comprising a single gaseous compound that is both an activator halide and a source of the modifying element in the process disclosed by Darolia with a reasonable expectation of success.

12. Regarding Claim 6, Darolia teaches the process according to Claim 3, in which the said active gas also contains at least one ammonium compound (see Column 7, lines 9 – 10, "... and a halide activator, preferably ... ammonium fluoride").

13. Regarding Claim 7, Darolia teaches the process according to Claim 1, in which the said active gas and/or the said gaseous compound are formed by the vaporization of at least one substance which is solid at ambient temperature mixed with the said precursor. Darolia teaches that the precursor of the modifying element is preferably zirconium chloride ($ZrCl_4$, as disclosed by Applicants), as discussed. Because $ZrCl_4$ is a solid at ambient temperatures as disclosed by Applicants, all of the limitations of the claim are taught by Darolia.

14. Regarding Claim 8, Darolia teaches the process according to Claim 1, in which the substrate contains at least one element which combines with the aluminum to form an intermetallic compound within the coating in which the aluminum is partly substituted by the modifier metal (see Column 4, lines

23 – 41, and specifically "The remainder of the diffusion aluminide internal protective layer, which is not aluminum and not the modifying element, is elements that are interdiffused into the diffusion aluminide internal protective layer from the substrate, primarily nickel," at lines 32 – 36.)

15. Regarding Claim 9, Darolia teaches process according to Claim 7, in which the element of the substrate is nickel (see Column 3, lines 28 – 30) and the intermetallic compound is β–NiAl. Applicants disclose that "the coating obtained essentially comprises the β–NiAl phase, which has a simple cubic structure. This phase has a wide range of non-stoichiometry from $NiAl^{(+)}$ (57% by atoms) to $NiAl^{(-)}$ (37% by atoms)." Darolia teaches, in Column 4, lines 23 – 25, that "... the average aluminum content of the diffusion aluminide ... layer is from about 16 to about 30 percent by weight." Because about 16 to about 30 percent by weight Aluminum corresponds to about 29 to about 48 percent by moles or by atoms in an essentially binary Nickel-Aluminum mixture, and because the process taught by Darolia is essentially the same as the process disclosed by Applicants, much of the nickel aluminide layers formed in the process taught by Darolia, from 37% to 48% Aluminum by atoms, would necessarily be β–NiAl as defined by Applicants, and thus all the limitations of the claim are met.

16. Regarding Claim 10, Darolia teaches the process according to Claim 1, in which the substrate is a nickel-based superalloy (see Column 3, lines 28 – 30). Regarding Claim 11, Darolia teaches the process according to Claim 1, in which the said active gas and/or the said gaseous compound contain at least one halogen (see Column 7, lines 19 – 21, and lines 33 – 36). Regarding Claim 12, Darolia teaches the process according to Claim 10, in which the said gaseous compound is zirconium chloride (see Column 7, lines 19 – 21, and lines 33 – 36). Regarding Claims 13 and 14, Darolia teaches the processes according to Claims 11 and 12, in which the said active gas contains ammonium fluoride (see Column 7, lines 9 – 10). Regarding Claim 15, Darolia teaches the process according to Claim 1, in which the said precursor is an alloy of aluminum and chromium (see Column 7, lines 6 – 8, and lines 15 – 17).

17. Regarding Claim 18, since Claim 18 fails to further limit the subject matter of Claim 1, it is rejected for the same rationale as Claim 1.

18. Regarding Claim 19, Darolia teaches a process according to Claim 1, in which the substrate and the precursor are located in an enclosure permitting only limited exchange with the exterior (see Column

7, lines 6 – 12, and Column 6, lines 41 – 58). Regarding Claim 20, Darolia teaches a process according to Claim 1, in which in addition to the active gas and the gaseous compound the said atmosphere comprises an inert or reducing gas and preferably hydrogen (see Column 7, lines 36 – 40).

19. Regarding Claim 21, Darolia teaches a process according to Claim 1, in which the modifier element is present in the said protective coating in a concentration by mass of less than 0.5% (see Column 3, lines 64 – 67 and Column 4, line 1, where it states that "The modifying element is hafnium, yttrium, zirconium ... The modifying element is present ... in an amount of from about 0.1 to about 5.0 weight percent of the diffusion aluminide internal protective layer.")

20. Regarding Claim 22, Darolia does not explicitly teach the process according to Claim 21, in which the said concentration by mass lies between 500 and 1000 ppm. However, because 1000 ppm corresponds to 0.1% by mass, and Darolia teaches that the modifying element can be present in an amount of about 0.1% by mass, Claim 21 is rendered *prima facie* obvious. See MPEP 2144.05.

21. Regarding Claim 23, Darolia teaches the process according to Claim 1, in which the said high temperature lies between 950 and 1200 C (see Column 7, lines 46 – 47, "The retort is usually heated to a deposition reaction temperature of from about 1800 F to about 2100 F," corresponding to a range of about 980 to about 1150 C, which falls completely within the range claimed by Applicants).

22. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darolia, and further in view of Fournes, et al (United States Patent 5,068,127, hereafter Fournes).

23. Darolia does not teach the process according to Claim 1, in which the substrate and the precursor are at a distance from each other or in which the substrate is located above the precursor. However, Fournes teaches just such a limitation, in which an above-the-pack vapor aluminiding process (see Column 1, lines 18 – 23) suspends the substrate(s) to be coated at a distance above the precursor (see Column 3, lines 10 – 21). Because Darolia teaches that above-the-pack aluminiding is "[an]other operable approach for introducing the source of aluminum ," (Column 7, lines 55 – 60), it would have been obvious to one having ordinary skill in the art at the time this application was filed to have utilized the above-the-pack substrate location taught by Fournes in the process taught by Darolia with a reasonable expectation of success.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ronald D. Lafond whose telephone number is (571) 270-1878. The examiner can normally be reached on M-F 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RDL

MICHAEL B. CLEVELAND
SUPERVISORY PATENT EXAMINER